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## (54) Queue management system

(57) A queue management system for managing at least one queue of people comprises a plurality of portable modules, at least one docking station, a queue manager, at least one module detector and a communication means. Each portable module includes memory means for containing a unique identification code, indicator means for indicating to the person or group of people carrying the module when it is time to join the or each queue, signal receiver means for receiving signals to cause the indicator means to be operative, transmitter means for transmitting the identification code over a short range, and docking means for downloading the identification code when the portable module is docked for registering the person or group of people in queue sequence for a respective queue.

The queue manager maintains the queue sequence for the or each queue and includes a communication means for receiving the or each downloaded code and a transmitter for transmitting the signals to each portable module to instruct the person or group of people carrying the portable module to join a queue.

GB 2 307 324 /

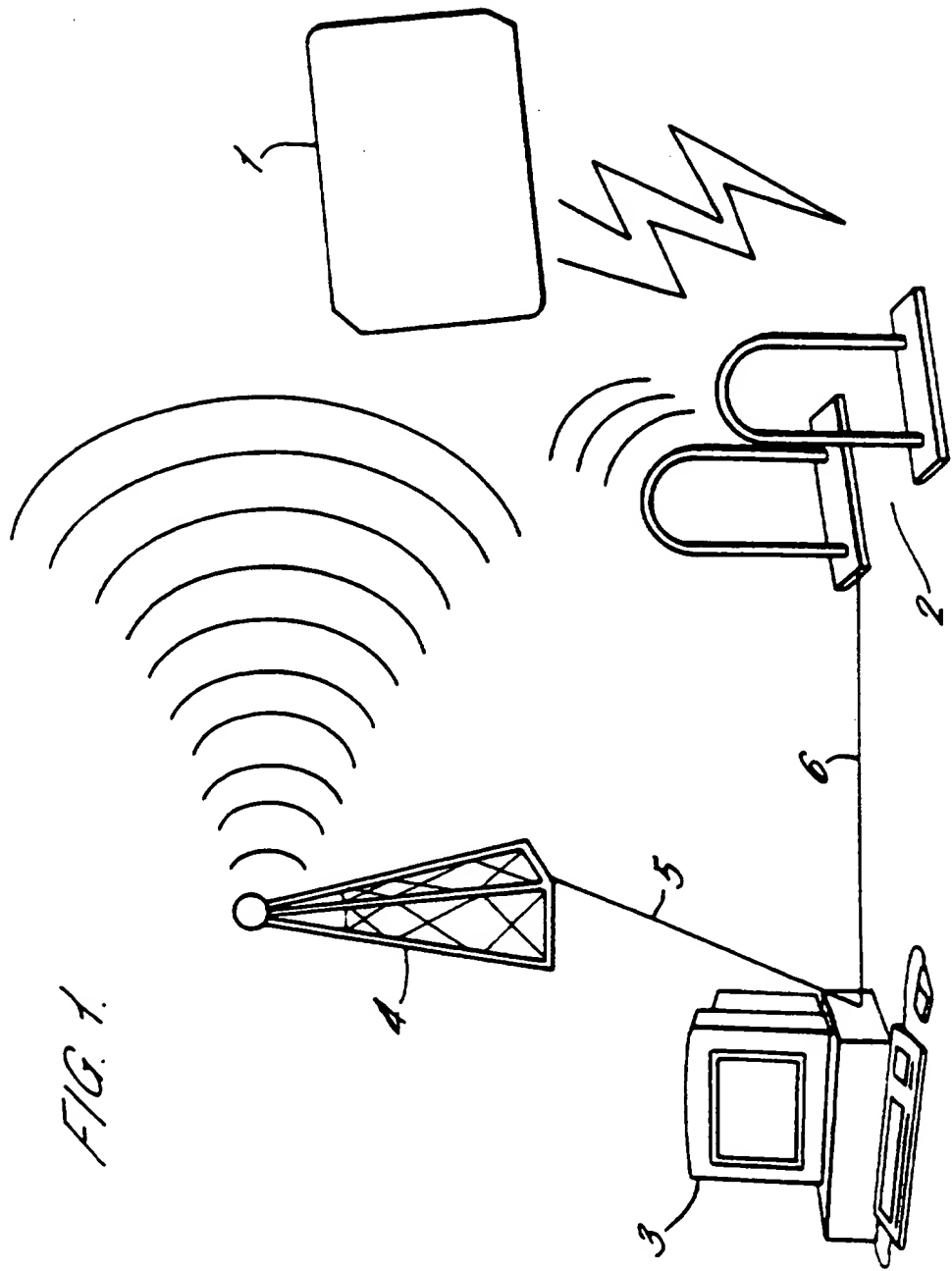


FIG. 1.

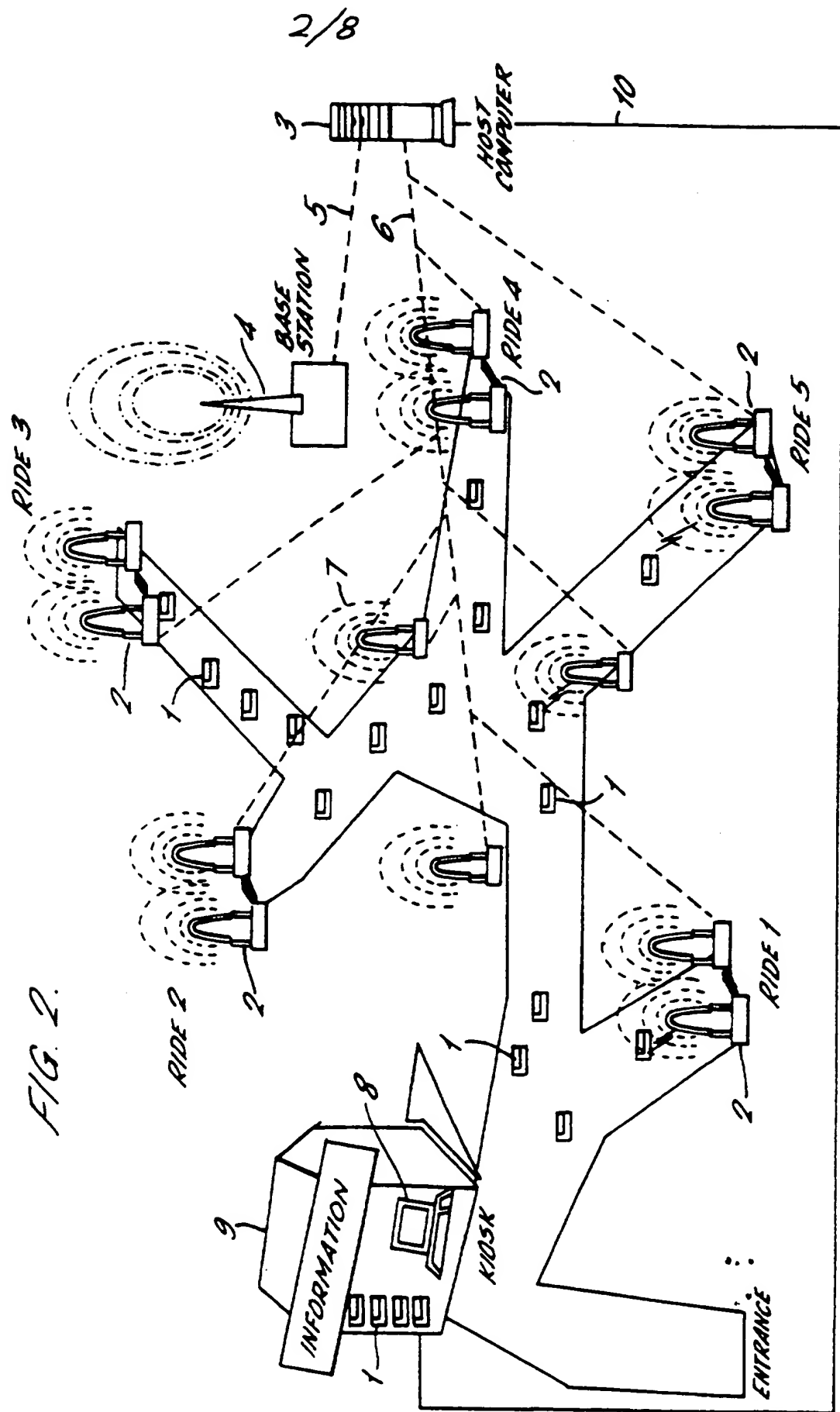


FIG. 2.

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FIG. 3.

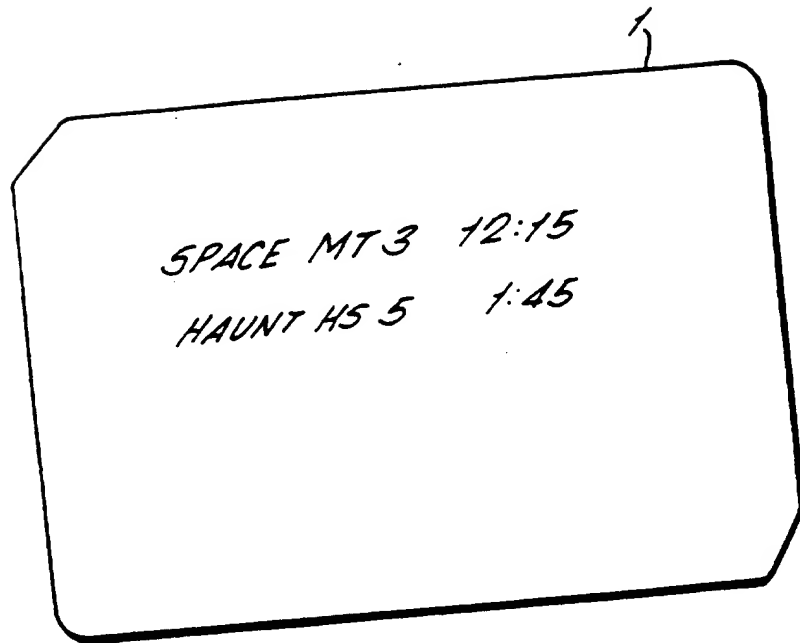


FIG. 4.

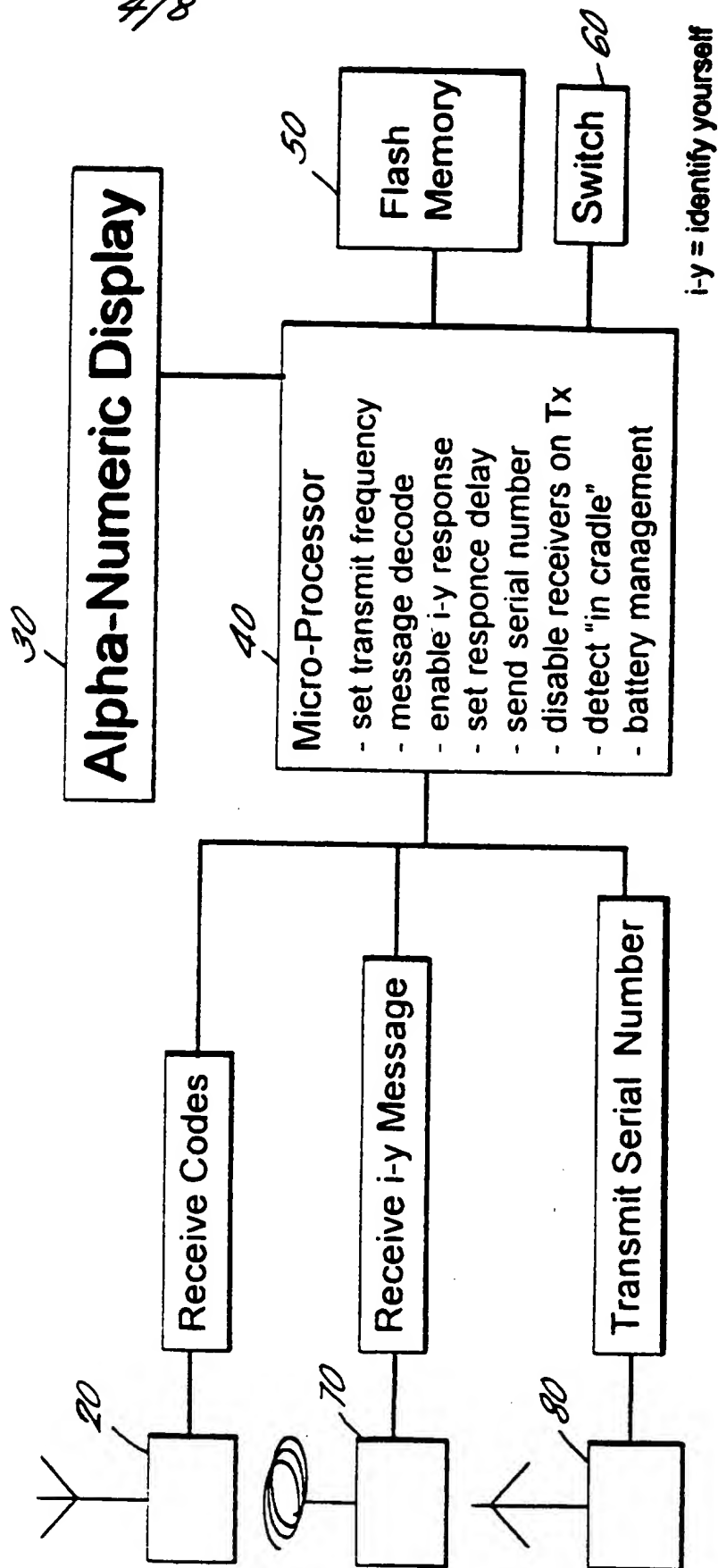
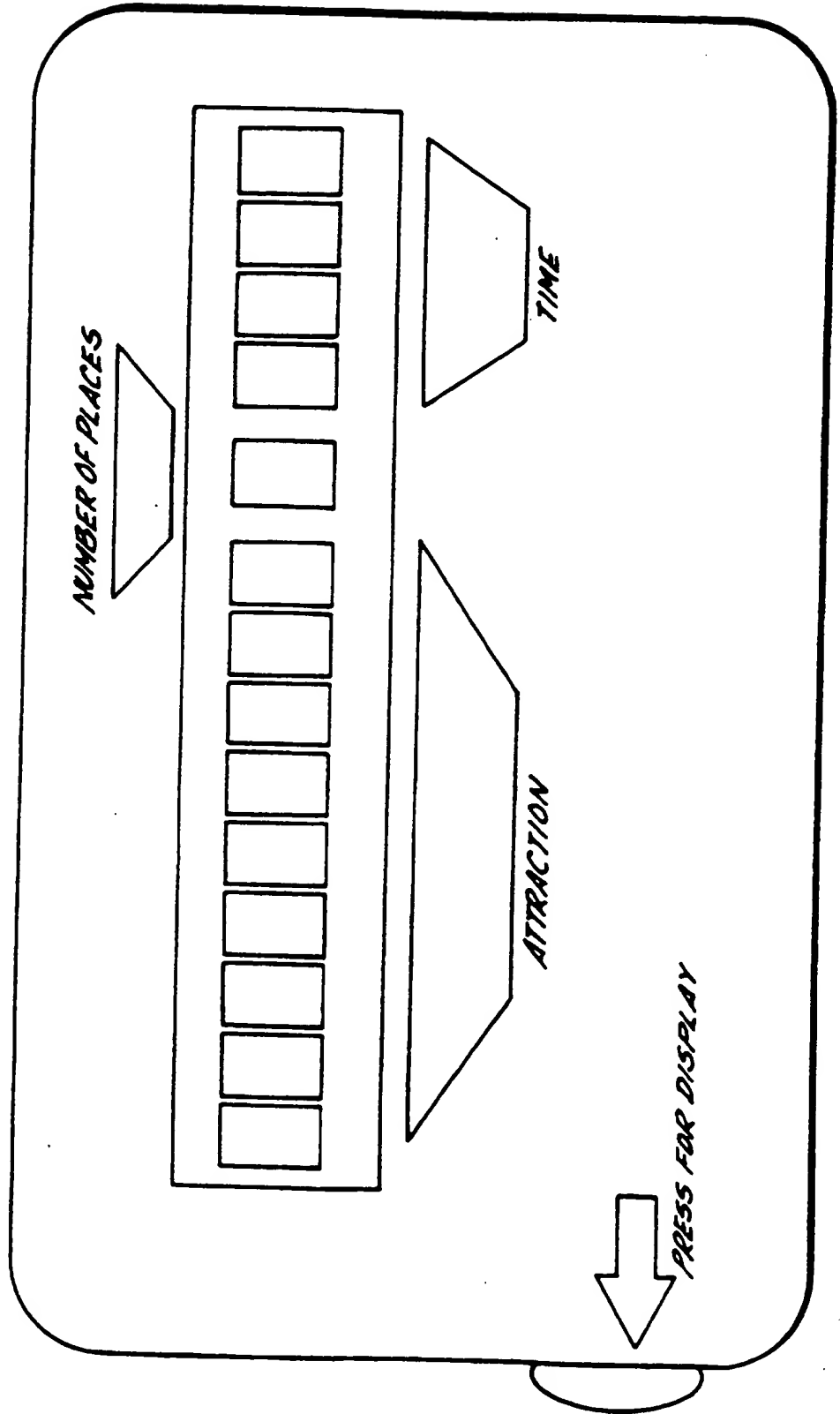


FIG. 5.



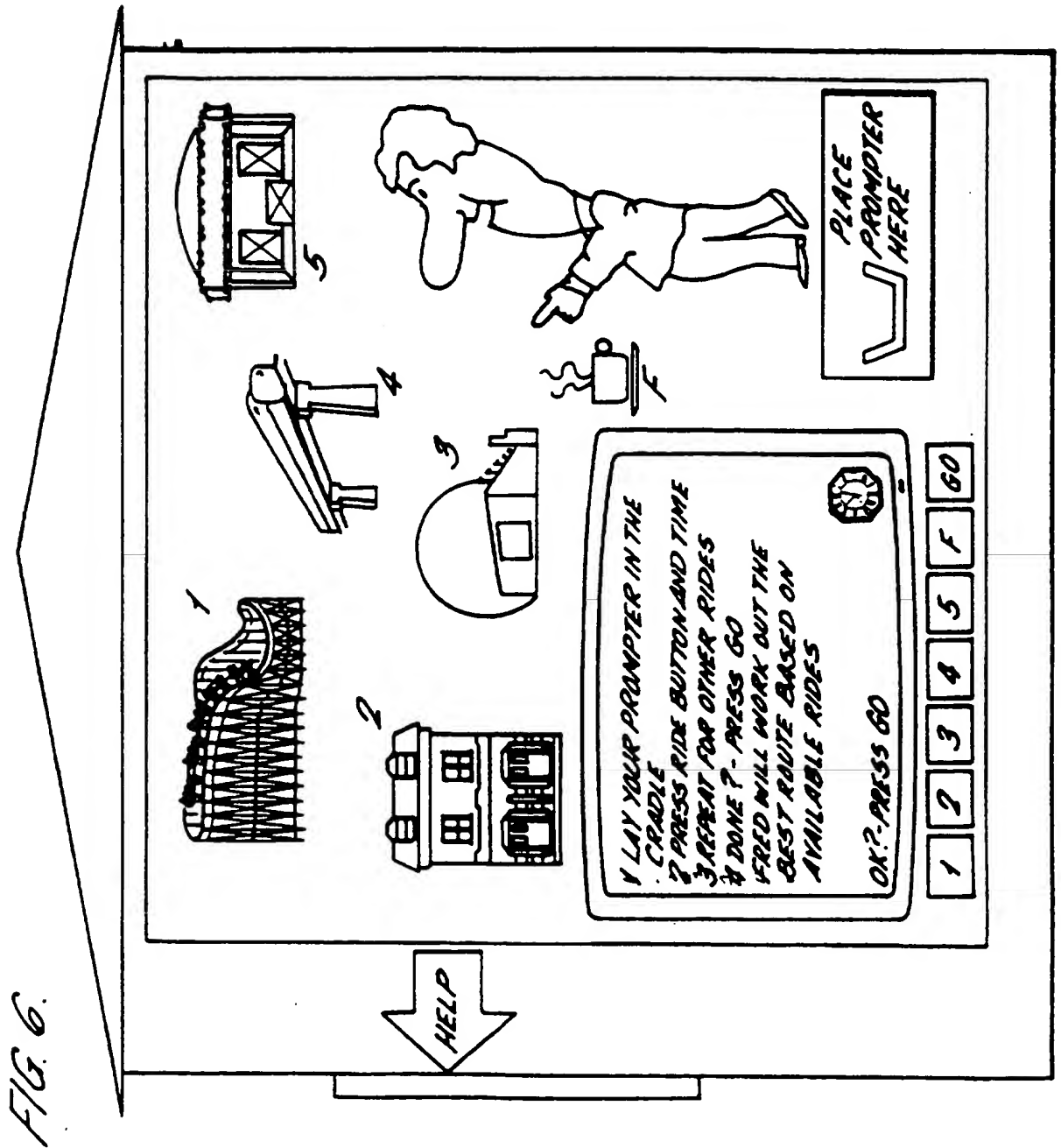




FIG. 7.

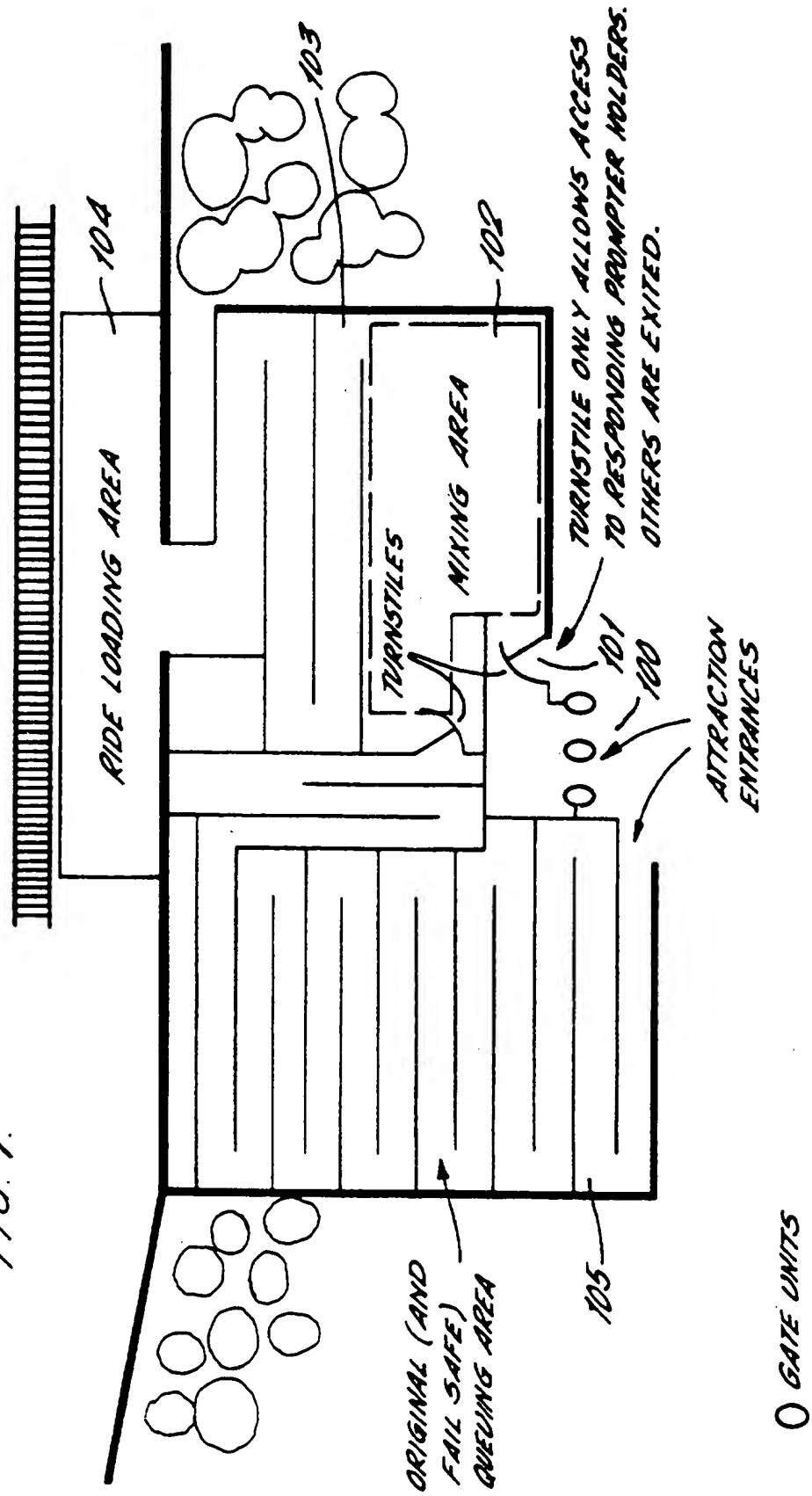
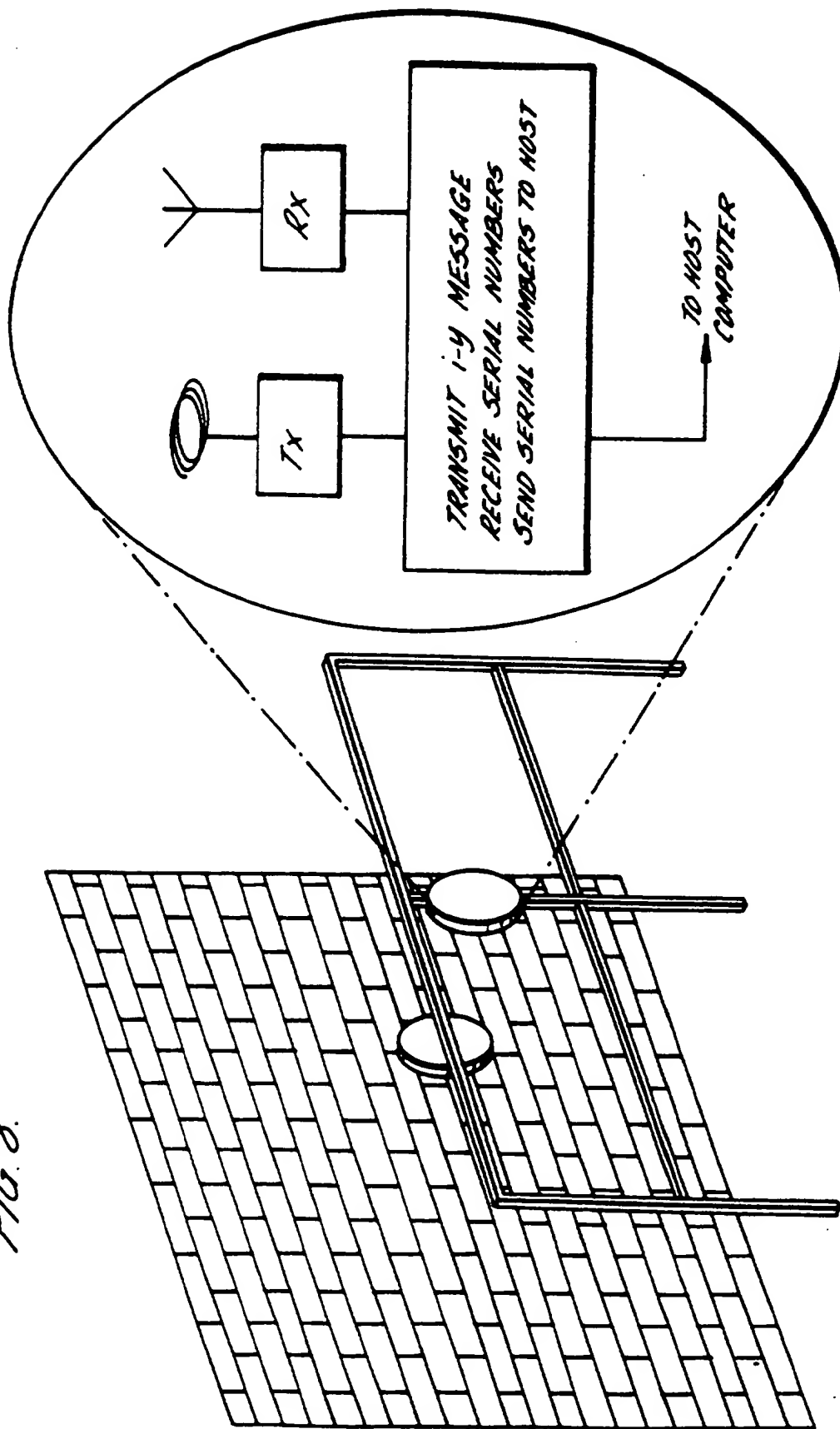


FIG. 8.



*I-Y = IDENTIFY YOURSELF*

QUEUE MANAGEMENT SYSTEM

5           The present invention generally relates to a queue management system for managing at least one queue of people.

          In many leisure pursuits (such as theme parks and museums) and other activities (such as arranging visas  
10       and immigration procedures), a large amount of time can be spent waiting in queues. The queuing is a frustrating and unproductive use of the time of the person in the queue and can be economically inefficient for the enterprise concerned. However,  
15       significant queues are necessary for at least part of the time in order to make efficient use of the particular resource.

          The problem of managing queues has been addressed in the prior art such as in EP0086199. In the system  
20       disclosed in EP0086199 a queue sequence for serving customers at a number of service points is determined once a customer has been allocated a turn number. The customer can then be told which queue to attend by observing a display.

25       This prior art arrangement is particularly suitable for queues such as in supermarkets wherein the queue time is generally not that long and the person will therefore accept the necessity for waiting near the queuing area and viewing the display.  
30       However, for multiple queues at remote locations or for one or more queues which have a considerable delay associated therewith, the system does not enable the person queuing to physically leave the queue without there being a possibility of the person losing their  
35       place in the queue.

It is therefore an object of the present invention to provide a queue management system which allows people to join a "virtual" queue, thus freeing the person from having to wait near the queue.

5       The present invention provides a queue management system for managing at least one queue of people, the system comprising a plurality of portable modules, each portable module being arranged to be carried by a person or a group of people and including memory means  
10       for containing a unique identification code, indicator means for indicating to said person or group of people when it is time to join the or each queue, signal receiver means for receiving signals to cause said indicator means to be operative, transmitter means for  
15       transmitting said identification code over a short range to confine the transmitted identification code to a local region around said person or group of people, and docking means for downloading said identification code when said portable module is  
20       docked; at least one docking station, the or each docking station being adapted to co-operate with said docking means of a said portable module for registering said person or group of people in queue sequence for a respective queue by downloading said  
25       identification code from said portable module when docked; a queue manager for maintaining the queue sequence for the or each queue and including first communication means for receiving the or each downloaded code, and a transmitter for transmitting  
30       said signals to each portable module to instruct said person or group of people carrying a said portable module to join a queue; at least one module detector for detecting any portable modules in the vicinity of the or each module detector by detecting any  
35       transmitted identification codes, a said module

detector being arranged at the location of the or each queue to detect when the person or group of people carrying said portable module joins the queue; and second communication means arranged between said queue manager and the or each module detector to communicate any detected identification codes to said queue manager; said queue manager being adapted to update the or each queue sequence using the or each detected identification code and the or each downloaded identification code to remove the or each detected identification code from the front of the respective queue sequence and to add the or each downloaded identification code to the back of the respective queue sequence.

The present invention can thus provide a queue management system which allows people who wish to queue to be free to undertake other activities. The time involved in physically queuing can be drastically reduced to perhaps a few minutes. The system maintains the place of users in each queue and informs them when they should physically join the queue.

Conveniently, the method of communicating between the portable modules and the queue manager is by way of radio paging messages which can be received and displayed by the portable modules.

Although conveniently the indication by the indicator means can be passed to the user visually, e.g. by a display, the indications could be audible, e.g. a spoken message or a tone.

The present invention also can provide information on the whereabouts of the users of the system which can, in some applications, provide very useful management information. In order to facilitate this, in accordance with one embodiment of the present invention the system includes at least one additional

module detector provided at locations away from the or  
each queue for detecting any portable modules in the  
vicinity of the or each additional module detector by  
detecting any transmitted identification codes, the or  
5 each additional module detector being connected to the  
queue manager by the second communication means and  
the queue manager being adapted to use any detected  
identification codes to track the locations of each  
person or groups of people carrying a portable module.

10 In order for the system to be able to distinguish  
whether a user is merely in the vicinity of a queue or  
has actually joined a queue, preferably the or each  
module detector includes a pair of detecting antennae  
arranged as a gate through which a person or group of  
15 people carrying a portable module will pass to join a  
queue. In this arrangement either the queue manager  
or the or each module detector includes correlation  
means to correlate signals for any detected  
identification codes from the pair of detecting  
20 antennae to determine whether a portable module has  
passed therethrough and if so to pass the detected  
identification code to the second communication means.

In this way the module detectors can identify  
whether the user is merely in the vicinity or has  
25 actually joined the queue. If the user is merely in  
the vicinity, the second communication means passes  
the detected identification codes flagged as  
representing portable modules being only in the  
vicinity of the module detector. Alternatively, the  
30 identification codes detected by the pair of detecting  
antennae are passed by the second communication means  
to the queue manager where the correlation is carried  
out to determine whether a user has passed through or  
merely by the pair of antennae.

35 In one embodiment the transmitter means of each

portable module is adapted to periodically transmit the identification code stored in its memory means.

In an alternative embodiment the or each module detector includes a prompting transmitter for  
5 transmitting a prompting signal over a short range to cause any portable modules in range to respond by transmitting their identification codes, each portable module including prompt receiving means for receiving the prompting signal and the transmitter means of each  
10 portable module being responsive to the received prompting signal to transmit the identification code stored in its memory means.

Thus, when a portable module comes within range of a module detector, its transmitted identification  
15 code will be received by the module detector and passed on to the queue manager. In order to avoid conflicts between transmissions from more than one portable module at the same frequency at the same time, interference can be avoided by delaying the  
20 transmission of the identification code for a random or pseudo-random delay period. Alternatively, some of the portable modules can transmit the identification codes at different frequencies or each portable module transmitting at the same frequency could transmit the  
25 identification code after a unique delay period.

In one embodiment the or each module detector transmits a unique prompting signal and the portable modules include identification means to compare the unique prompting signal with a stored prompting signal  
30 corresponding to a respective queue to determine whether the person or group of people are at the correct queue, and means to indicate to the person or group of people whether or not the person or group of people are located in the correct queue.

35 When the system is designed for use in a defined

area, e.g. theme park which has exits, the system preferably includes at least one module detector at each exit to detect portable modules to prevent the portable modules being removed from the defined area.  
5 This prevents the loss of the portable modules by deliberate or accidental removal from the defined area.

Preferably the or each docking station includes queue display means for displaying a selection of  
10 queues which the person or group of people may wish to join, input means to allow the person or group of people to select which queue they wish to join and downloading means for downloading the identification code of the docked portable module, for passing the  
15 downloaded identification code to the queue manager via the first communication means, and for passing the identity of the or each queue which the person or group of people wish to join to the queue manager via the first communication means. The queue manager is  
20 adapted to register the person or group of people in at least one queue sequence dependent upon the downloaded identification code and the received queue identity.

In an alternative embodiment, a person can  
25 remotely register for a plurality of queues using a remote input arrangement, e.g. a display and keys. Such an arrangement could for instance be provided at the user's hotel. When a user registers in this way a portable module identification code (or the portable  
30 module itself) is assigned to that user. The user can then either pick up the assigned module later or by for example using a password, select a portable module and have the assigned identification code uploaded to the portable module when the portable is docked. For  
35 this facility a means of identifying such a user is



required. This can take the form of a password for example which can be given to an attendant to receive the assigned portable module or it can be input to the docking station when a portable module is docked to  
5 cause the queue manager to upload the assigned identification code.

In order for the queue manager to receive data on the person or group of people who are using the portable module, the display means and the input means  
10 of the or each docking station are preferably adapted to respectively display requests for data on the person or group of people and to allow the input of such data for transmission to the queue manager via the first communication means.

15 The docking station conveniently allows the person or group of people to select a preferred sequence of queues to be joined and preferred times of joining the queues and allows the reselection of the preferred sequence and the preferred times at a later  
20 time.

For multiple queues, the queue manager optimises the position of a person or group of people in each of the queue sequences to allow the person or group of people to join each queue and attend each event being  
25 queued for. In order to do this, the queue manager preferably includes queue information storage means to store information on the predicted rate at which the or each queue will move and the actual rate of queue movement and the queue manager is adapted to use the  
30 store information to optimise the length of the or each queue sequence and to enable the optimisation of the sequence of queues. Once the queue manager has determined the optimum queue sequence, it transmits data on the queue sequence and times at which the  
35 queue should be joined to the portable modules and

this data is stored in the memory means of each portable module for display.

In order to avoid the necessity for transmitting a large number of messages to each portable module, in accordance with one embodiment of the present invention each portable module includes a message memory for storing a plurality of standard messages. The queue manager is adapted to send a desired message activation signal to the selected portable modules whereupon the selected portable modules display a desired message from the stored plurality of messages on the display in response to the activation signal.

In one embodiment the queue manager is able to send a control signal to selected said portable modules whereupon the selected portable modules respond by switching the mode of operation to revert to a normal pager messaging mode.

In one embodiment, when a user registers for a queue sequence, the time of registration is logged by the queue manager. The queue manager is able to transmit messages to each of the portable modules which have been registered within a certain time window. This feature is useful where managers of a theme park wish to allow its users only a limited number of hours of access to the park or to certain activities. A message can be sent to the users which registered within a time window. This allows a transmission of a "time-out" message transmitted to the users which are registered within a time window to indicate that they no longer have access to the park or to certain activities and should leave.

In the present invention when a portable module indicates that the user should join a queue, there is no guarantee that the user will respond by joining the correct queue at the correct time. Therefore, in

order to ensure that the multiple queue sequencing runs smoothly, the present invention preferably includes an access control mechanism associated with the or each module detector to allow access to a queue area for a queue and the queue manager is adapted to compare an detected identification code with the identification codes of the queue sequence associated with the queue to determine if the detected identification code falls within a predetermined range of the front of the queue sequence, and to transmit an access denied signal over the second communication means to the access control mechanism if the detected identification code is determined to be outside the predetermined range. The access control mechanism is then responsive to the access denied signal to prevent a person or a group of people carrying the portable module associated with the detected identification code from gaining access to the queue area. Preferably the queue manager is adapted to transmit an explanatory message to the portable module which has been denied access to the queue area to explain the reason why access has been denied.

Alternatively, each portable module is adapted to store a default acceptance time window associated with each queue for which the identification code of the portable module has been entered in the queue sequence reason messages, a portable module which has been denied access being adapted to identify the pair of antennae to determine whether the portable module is at the correct queue area at the correct time, and to select and display an appropriate reason message to explain why access has been denied.

In one embodiment a plurality of portable modules can be assigned as a group and each member of a group of portable modules has an identification code which

identifies which group the portable modules belong to. The or each docking station is adapted to allow the selection of the option for the members of a group of people to allow them to each have a portable module.

5 For members of a group, when one member places the portable module in the docking station, it is possible for that member to input a group specific message which is sent by the queue manager to all members of the group. It is also possible for the group member  
10 to request information on the locations of the group members. The queue manager is able to provide such information which is then displayed at the docking station to allow the group member to locate other members of the group.

15 Since the queue manager is able to monitor the location of the portable modules, it is possible for the queue manager to send area specific messages to portable modules which are known to be in a specific area. Such messages can for instance be prompting  
20 advertisements for local attractions or information on local facilities.

When the portable module is docked in the docking station, it is possible for a user to select the language of the messages to be displayed by the  
25 portable unit. Also, the queue manager is able to set the messages which are stored in the message memory and the frequency of operation of the transmitter within the portable module. Further, the queue manager can download the default acceptance time  
30 window, e.g. +5 mins, -10 mins.

In one preferred embodiment the present invention can also provide a plurality of portable tagging modules, each portable tagging module being arranged to be carried by a person or a group of people to be  
35 tracked. Each portable module comprises memory means

for containing the unique identification code,  
transmitter means for transmitting the identification  
code over a short range to confine the transmitted  
identification code to a local region around the  
5 person or group of people carrying the portable  
tagging module, and docking means for docking with the  
or each docking station for downloading the  
identification code to the queue manager. The or each  
docking station is adapted to allow a person or group  
10 of people carrying a portable module to associate at  
least one portable tagging module with the portable  
module. A docking station can prompt the selection of  
a tagging option when the portable module is docked to  
download the identification code thereof and to  
15 subsequently request the docking of a portable tagging  
module to download the identification code thereof.  
The queue manager is then responsive to the downloaded  
identification codes to associate the identification  
codes. The or each docking station is further able to  
20 transmit a location request signal for associated  
identification code of a portable module or tagging  
module when a portable module or portable tagging  
module is docked. The queue manager responds to the  
location request signal to transmit information on the  
25 location of the associated portable module or portable  
tagging module to the docking station for display  
thereby.

Where there are fees associated with one or more  
queues, in accordance with one embodiment the or each  
30 docking station includes payment means for receiving  
payment in respect of a queue which has a fee  
associated therewith. The payment means is adapted to  
request payment and await receipt of payment before  
registering a person or group of people in a queue  
35 sequence for a desired queue which has a fee

associated therewith.

5 In an alternative embodiment of the present invention near each docking station includes payment means for receiving payment to be credited to the person or group of people carrying a portable module and the payment is associated with the identification code of the portable module. The queue manager includes credit storing means for receiving and storing information on the payment to be credited to a portable module from the docking station, queue cost information memory means containing information on the cost of the or each queue which has a fee associated therewith, and debiting means for debiting funds from the credit stored in the credit storing means when the queue manager receives a downloaded identification code from the module detector at a queue which has a fee associated therewith. The queue manager is adapted to transmit information on stored credit in the credit storing means through a portable module to that portable module for display to allow the user to determine how much credit he has left.

In the above alternative embodiments the payment means can conveniently comprise a credit card reader.

25 It can thus be seen from the above that the system can conveniently comprise a combined short range pager unit and electronic tag, gate units and a base station including a controlling computer.

30 In the present invention the queue sequence comprises a "virtual" queue which conveniently resides in a computer system's memory and holds a user's place in the queue in the same order as if he had remained physically present.

35 Embodiments of the present invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic drawing of the basic elements of the system in accordance with one embodiment of the present invention;

5 Figure 2 is a schematic diagram of the system in operation in a theme park in accordance with one embodiment of the present invention;

Figure 3 illustrates the display of the portable module;

10 Figure 4 is a block diagram of the portable module;

Figure 5 is a diagram of the portable module illustrating the one line scrolling display;

Figure 6 is a schematic illustration of a docking station;

15 Figure 7 is a schematic diagram of a typical ride queuing area; and

Figure 8 illustrates a gate unit in accordance with one embodiment of the present invention.

20 Referring now to the drawings, as can be seen in Figure 1 the system comprises a portable module comprising a combined short range pager unit and electronic tag, gate units 2 and a base station comprising a controlling computer 3 and a transmitter 4. The controlling computer 3 is linked to the  
25 transmitter 4 by a communication line 5 to allow the transmission of messages to the portable module 1. The controlling computer 3 is also linked to the gate units 2 by a further communication line 6 to receive downloaded identification codes which have been  
30 detected by the gate unit 2 from the portable unit 1.

Figure 2 illustrates the arrangement of one embodiment of the present invention used in a theme park. As can be seen in Figure 2, a central computer 3 receives downloaded identification codes from a  
35 plurality of gate units 2 positioned at various rides

in the park. Also, the controlling computer 3 receives downloaded identification codes from additional module detectors 7 positioned throughout the park to enable the position of portable modules to be determined.

In a theme park there is also provided a docking station 8 within an information kiosk 9. As people enter the theme park via the entrance, they can go to the information kiosk 9, take a portable module 1 from a rack and insert it in a docking station 8.

Figure 6 illustrates the display which will allow the user to select the queues to be joined. In Figure 6 the portable module has been termed a "prompter". When the prompter is docked in the docking station its identification code is downloaded and sent via the communication line 10 to the controlling computer 3. Also, the queues (or rides) which the user has registered for will be sent to the controlling computer 3 together with the preferred times and preferred sequence of rides to enable the controlling computer to determine the optimum sequence and time of the rides. Once the sequence of rides has been entered and the prompter removed from the docking station, the controlling computer 3 will transmit messages to each of the prompters 1 indicating the sequence and times of the rides. Such a message is illustrated in the illustration of the prompter in Figure 3. Figure 5 illustrates an alternative display arrangement which allows for the display to scroll across to indicate the ride or attraction, the number of places reserved in the queue and the time at which the physical queue should be joined.

Thus having registered in the "virtual" queue for a number of rides, the user is free to utilise time which would normally be taken up by queuing by



visiting other attractions in the park. When it is time to join a physical ride queue, the user will pass through or by the ride gates 2 which will detect the presence of the prompter 1 by receiving its  
5 identification code. This identification code is then downloaded to the controlling computer 3.

Thus the prompter comprises a combined short range pager unit and electronic tag which is capable of receiving messages from the central computer 3 via  
10 the transmitter 4 at the base station by techniques used in commercially available "on site pagers". The prompter 1 includes an electronic tagging system and a memory containing a unique serial number to identify the particular prompter and hence its associated user.  
15 The prompter unit is capable of transmitting the serial number when required to be detected by the module detectors 2. The transmitter can be of any conventional type such as that used in automobile remote locking or security systems. This transmitter  
20 can be arranged either to transmit the identification signal periodically or only in response to a prompting signal from the gate units 2.

Figure 4 is a block diagram of the portable module 1 of the present invention. A receiver 20  
25 receives paging messages in the form of codes to cause the display of messages on the display 30. A microprocessor 40 is provided to decipher the receiver codes and the microprocessor 40 has a memory 50 and switch 60 associated therewith. The portable module  
30 also has a receiver 70 for receiving the "identify yourself" signals from the gate units 2 and the module detector 7. The microprocessor 40 is responsive to the "identify yourself" signal to record the transmission of the portable module's serial number  
35 via the transmitter 80.

The portable unit is able to display the ride sequence and times. The display can conveniently be an alphanumeric display. A simplified prompter can be provided without such an alphanumeric display with a  
5 simpler ride indication arrangement for applications which do not require readable messages.

Registration for queues by users can be received either automatically by the removal of a prompter from a dispenser for a single ride or for multiple rides  
10 the user will be required to enter manually the required rides and ride sequence following the instructions on the display as shown in Figure 6.

Normally groups would work with a single prompter for the whole group, but it is possible for individual  
15 members of a group to each be provided with a prompter. This is an option which can be made available at the docking station whereby a group of prompter can be assigned to be associated as a group whereby their identification numbers which are  
20 downloaded to the controlling computer are marked as being associated with a group.

The identification codes of prompters can either be preloaded or downloaded from the controlling computer when the prompter is docked. Other  
25 information and commands can also be downloaded from the controlling computer, e.g. the transmission frequency of the transmitter of each prompter. Also, the language or the messages to be displayed on the display of the prompter can be selected by a user at  
30 this stage.

Thus for activities involving multiple queues, the controlling computer can accept time and sequence preferences from the user during registration. The user also has the facility to reset his sequence and  
35 time preferences at any time after registration.

The controlling computer 3 will, after registration, transmit activation codes to initiate the display of messages to advise the user when they should join a physical line, or to display other standard messages. A suite of standard messages, each enabled by its activation code, is stored in read-only memory (ROM) in the prompter to increase the number of messages that can be transmitted in the required update time. Other activation codes can produce specific modes of operation in the prompter. One particular code will enable a specific prompter to revert to a normal pager messaging mode for applications where this option is included.

The queue manager consists of a number of modules with clearly defined interfaces. Reliability through redundancy is achieved by having a duplicate computer system which operates the same software and is input with the same data. The modules are:

**User Database**

- record structure
  - Record Entry
  - Record Selection
  - Record Update

**Queue Database**

- list of prompters queuing for each feature
  - Select Information from User Database
  - Add or Remove Records
  - Calculate Attendance Times and Route
  - Determine Optimum Queue Sequence(s)
  - Calculate or Accept User Attendance Time Windows

**Transmission**

- messages to be sent by the base station to the prompters
  - Format Messages
  - Sequence Messages

## Interface to Transmitter

### Interfaces

- drivers/format for communication other than transmission above

#### 5       Input Terminals

Accept Preference Information

Download to Prompters (serial number, frequency features as appropriate)

#### Gate Units

#### 10       Correlate Signals at ride entrances

Standard packages and interfaces are used wherever possible.

The gate units 2 include circuitry to at least passively listen for the transmitted identification codes and preferably include circuitry to transmit the prompting signal. The gate units will be set up at the entrance to the physical queue to control access to the queue area. The signals from such gate units can have an identification feature built in so that the prompter can recognise if it is at the correct location and provide a message to the user. Such an identification feature can be achieved by for example pulsing the transmitter on and off, modulating the signal, setting the frequency of the signal, or selective polarisation of the signal. When the gate unit 2 detects an identification code this is downloaded to the host computer. If it is determined that the identification code corresponds to an identification code within a predetermined region of the front of the queue sequence held within the memory of the controlling computer 3, the user is permitted access through the gate units. If, on the other hand, the detected identification code is not within a predetermined range on the front of the queue sequence, a signal is transmitted by the host computer

to the queue area to deny the user access to the queue area. The controlling computer 3 also transmits a message to the prompter to give a reason as to why access has been denied. Access could be denied  
5 because the user has arrived either before or after the time, is at the wrong ride or the user is at the wrong ride and at the wrong time.

Throughout the park area module detecting units 7 are provided simply to collect detected identification  
10 codes of prompter in the vicinity. These detected identification codes are downloaded to the controlling computer 3 to enable the controlling computer 3 to monitor the location of the prompter 1 within the park.

15 In large systems there is a likelihood of interference between transmitted identification codes of prompter in the locality of the gate units 2 or the module detectors 7. There are a number of ways in which this problem of interference can be reduced or  
20 avoided. The queue control infrastructure and gate unit positioning can be appropriately designed in order to provide sufficient separate between prompters, e.g. by using turnstiles, barriers and the like. Also, the power level of the transmitters of  
25 the prompters can be reduced and the sensitivity of the receivers of the gate units 2 and the module detectors 7 altered. Further, a random or pseudo-random delay can be introduced into the response time of the transmitters to the prompting signal from the  
30 gate units 2 and module detectors 7. Alternatively, different prompters can use different frequencies. Further, responses from the portable units can be sequenced by the controlling computer sending enabling activation codes such that only a certain proportion  
35 of the prompters which share the same transmitter

frequency can respond at any one time. Another method of overcoming interference problems is to allow the prompter to transmit its identification code more than once while it is in the vicinity of the gate unit 2 or the module detector 7.

Figure 8 illustrates one arrangement for a gate unit. A receiver is placed either side of a gateway to detect identification codes of prompter carried by users as they pass through the gate. The identification codes detected by the two detectors are correlated to determine whether a prompter is merely in the vicinity or has passed between the detectors.

Figure 7 illustrates a ride queuing area wherein there are provided entrance gates 100 through which users pass. If the users are early, late, or in the wrong queue, the turnstile 101 will deny access into the mixing area 102 which is the end of the short queue 103 for the ride loading area 104. As can be seen in Figure 7, this ride queuing area allows for the park to allow for only some users to use the portable units. Park users without portable units will have to join the conventional long queue 105.

Thus installation of the queue management system should maximum ride/show utilisation, ease park management issues, raise spending on secondary attractions and most importantly, greatly increase customer satisfaction. Some modification of the queuing infrastructure in the park is required, and staff could carry portable modules for communication purposes and to give their management information on their location.

The park management benefits will include the following:

- 1) greater control in crowd movement,
- 2) increased staff control,

- 3) information in advance on user movement preferences,
- 4) the ability to shorten attendance time when required by controlling routing and attraction attendance such that users will be led to exit areas earlier, and
- 5) automatic supply of information for customer research.

The system would require minimal staff assistance to minimise staff increase and, where appropriate infrastructure design, the system is failsafe defaulting to exiting systems in case of a catastrophic fault. The park visitor or user would use terminals installed at park entry points and at information kiosks throughout the park to enter ride and time preferences. The system would request other relevant information such as height or health status, which may be relevant in allowing access to certain rides. In the case of a group of visitors sharing one portable module, information on each individual will be required.

The advantages of embodiments of the present invention are:

- 1) Easy and attractive audio visual question and answer interfacing to the input terminals at the docking stations by an attractive kiosk design, simple keyboard and a fun, interactive, guide character,
- 2) A rendezvous aid service for groups using multiple portable modules. A member of a group which has been split up could place his portable module in the docking station at one of the information kiosks and the system could send a message to the portable modules of the rest of his group with a suggested rendezvous point.

- 3) A lost child/child security device. This could optionally use a smaller unit without the message display facility, where a specific activation code enables the ability to respond to every identify yourself message from every gate unit. An option is to have an even smaller unit without any pager receiver circuitry which would operate continuously, responding to every identify yourself message from every gate unit.
- 4) Zone specific messages promoting other utilised attractions, other promotional messages and competitions.
- 5) Where separate attractions have separate tickets, the portable module could act as an electronic ticket. Registration could be coupled with automatic payment by a credit card reader in the docking station.
- 6) Theft or accidental removal of the portable module from the park could be controlled by having a gate unit at each of the park exits.
- 7) Portable modules which display in multiple languages can be offered as an option.

Whilst it is expected that all users or user groups would carry prompters, partial usage would be possible as a premium service with an increase in the standard fee.

The controlling computer 3 can store information in a database on each user and each member of a group, e.g. preferred language, attractive preferences, time preferences, calculated optimum route, the number in the group, attraction restriction information by individual user, other relevant information on the user, e.g. any relevant disability, baby being carried, stroller present etc., optional services activated (which might require additional user



information), and credit available (where applications where individual ride tickets are used and the portable modules acts an electronic ticket).

5       The controlling computer 3 can operate to include  
a procedure which can ensure that a user registering  
late in the day would be given access to the same  
number of queues as a user registering earlier in the  
day. Such a user could join certain queues near the  
front. The structuring and managing of the queues are  
10 features which can be customised to suite a particular  
situation. The controlling computer 3 will thus  
operate in accordance with the customised algorithm to  
manage the queues.

15       The controlling computer 3 can be programmed to  
re-allocate every user's sequence used in accordance  
with a preset algorithm or to cope with unexpected  
events. In order to warn the user of this  
possibility, when the user registers and is shown a  
route to the queues, and the queue sequence, an  
20 explanation of this possibility will need to be  
presented to the user.

Three examples of situations which could result in the re-allocation of every user's sequence are

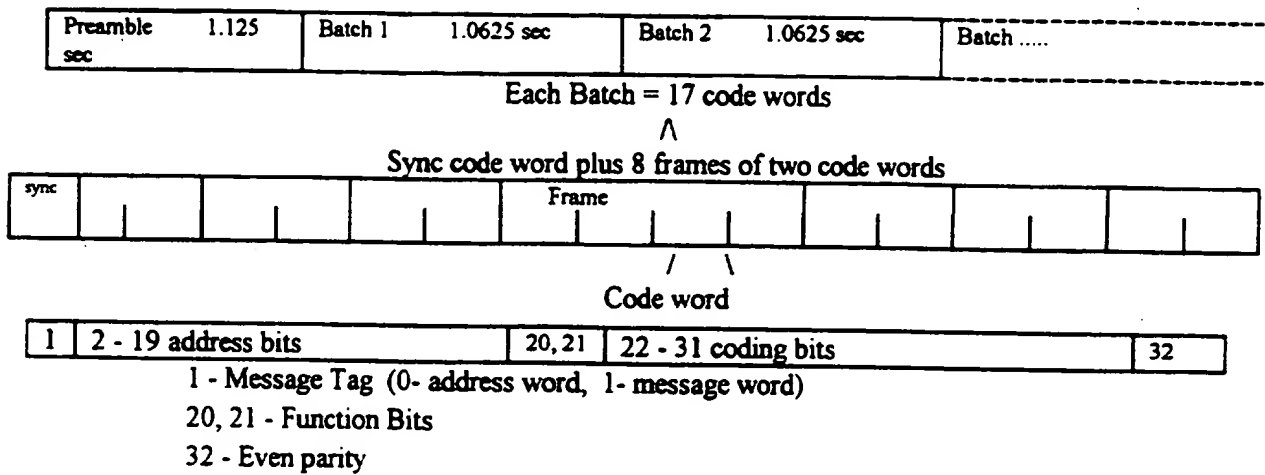
- 25       1) The theme park is lightly loaded and certain  
rides are to be closed down. The late users may  
not physically be able to get from one ride to  
another in time without some re-arrangement of  
queues, even though slots are available.
- 30       2) It may be policy that every user gets a minimum  
number of rides (depending on the time  
registration). If the weather meant that a park  
was lightly loaded in the morning but full in the  
afternoon, the morning attendees may have had a  
large number of rides. These morning attendees  
35 could then be given a reduced number of rides in

the afternoon to allow an increased number of rides to the late attendees.

- 3) If ride failure occurs it may be fairer to reallocate all the queues.

5       As described hereinabove, the portable module of the present invention can utilise conventional paging message techniques.

The POCSAG protocol is one of a number of messaging protocols used in paging. Any protocol can be modified in a similar way to provide the activation of pre-stored messages. The framing structure is as follows



Possible activation codes are shown in the table below and these are such that one frame is needed to define a command or initiate a pre-stored message, except when special features such as the text messaging mode is used.

The standard structure could be modified as follows:

1 - 14 address bits	15	16 - 31 Message / Command Coding bits	3
			2

15      Set Mode  
 32      Even parity

Prompters store and display two messages, one each for the next and subsequent attraction.

The second message is sent every 5th time slot, the first message every other.

Messages and commands are shown in the next two tables

Special Mode and Programming Commands cannot be transmitted by the base station. They are only used when prompter is in a kiosk docking station, or at the maintenance base for programming.

The standard messages, with various language versions if required, are stored in memory in the prompter.

Table 1 - Control and Pager Modes (Bit 15 = 1)

16	Bit Position and Meaning		Note
1	<b>Control Mode</b>		
1	17/18	20 -31	
1	00	Command Mode (Normal)	
1		Enable I-Y response	
1		Continuously transmit serial #	
1	01	Special Mode (Cradle)	
1		Select language	- x choices
1		Set Transmit Frequency	
1		Set Other Parameters	
1		Flash Memory Download	
1		Programming Mode	
1	10	Message Mode	
1		Contact Nearest Kiosk	
1		Stay Where You Are	
1		Go to Nearest Kiosk	
1		Call Your Home	
1		Call Your Office	
1		/	
1		Park Closing	
1		Ride Restrictions Apply	
1	11	Special	
0	<b>Pager Mode</b>		
	17 - 31	Two Character Bytes	
0	First Byte can enable certain standard message		eg Call the following number

**Table 2 - Normal Mode (Bit 15 = 0)**

<i>Bits</i>	<i>Message Class</i>	<i>Message Specific</i>	<i>Display</i>
16	First / second attraction message	sets location to store the updated message	
17 - 24	Attendance time	Time (240 time slots in 12 hours)	yy:zz
25 - 27	Number of Places		Number from 1-8
28 - 31	Attraction	Blank	
		Space Ride	Ride/Feature Name
		Bear Show	- "
		Rocky Hill Railway	- "
		\	\
		Haunted Cottage	- "
		Mission to Venus	- "
	Restaurants	French Restaurant	- "
		Italian Restaurant	- "
		Slow Food Restaurant	- "
		Japanese Restaurant	- "
		Club 34	- "
		Attraction Closed	Out of Service

In the POCAG protocol it is possible to refresh the messages of more than 4,000 portable modules every three minutes. If different pager frequencies are used, the number of portable modules from which the messages can be refreshed in three minutes increases by the number of frequencies used. Thus, this arrangement can provide for a large number of users in a multiple queue environment.

Although the present invention has been described hereinabove with reference to specific embodiments, the present invention is not so limited and modifications smaller than the scope of the claims will be clear to a skilled person in the art.

CLAIMS

1. A queue management system for managing at least one queue of people, the system comprising  
a plurality of portable modules, each portable  
5 module being arranged to be carried by a person or a group of people and including memory means for containing a unique identification code, indicator means for indicating to said person or group of people when it is time to join the or each queue, signal  
10 receiver means for receiving signals to cause said indicator means to be operative, transmitter means for transmitting said identification code over a short range to confine the transmitted identification code to a local region around said person or group of  
15 people, and docking means for downloading said identification code when said portable module is docked;  
at least one docking station, the or each docking station being adapted to co-operate with said docking  
20 means of a said portable module for registering said person or group of people in queue sequence for a respective queue by downloading said identification code from said portable module when docked;  
a queue manager for maintaining the queue  
25 sequence for the or each queue and including first communication means for receiving the or each downloaded code, and a transmitter for transmitting said signals to each portable module to instruct said person or group of people carrying a said portable  
30 module to join a queue; at least one module detector for detecting any portable modules in the vicinity of the or each module detector by detecting any transmitted identification codes, a said module detector being arranged at the location of the or each  
35 queue to detect when the person or group of people

carrying said portable module joins the queue; and  
second communication means arranged between said  
queue manager and the or each module detector to  
communicate any detected identification codes to said  
5 queue manager;

said queue manager being adapted to update the or  
each queue sequence using the or each detected  
identification code and the or each downloaded  
identification code to remove the or each detected  
10 identification code from the front of the respective  
queue sequence and to add the or each downloaded  
identification code to the back of the respective  
queue sequence.

15 2. A queue management system as claimed in Claim 1,  
wherein said transmitter of said queue manager is  
adapted to transmit radio paging messages to each  
portable module, and said signal receiver means of  
each portable module is adapted to receive said radio  
20 paging messages.

3. A queue management system as claimed in Claim 1  
or Claim 2, including at least one additional module  
detector provided at locations away from the or each  
25 queue for detecting any portable modules in the  
vicinity of the or each additional module detector by  
detecting any transmitted identification codes, the or  
each additional module detector being connected to  
said queue manager by said second communication means,  
30 and said queue manager being adapted to use any  
identification codes detected by the or each module  
detector and the or each additional module detector to  
track the locations of each person or group of people  
carrying a said portable module.

4. A queue management system as claimed in any preceding claim, wherein the or each module detector includes a pair of detecting antennae arranged as a gate through which a person or group of people carrying a said portable module will pass to join a queue, the or each module detector including correlation means to correlate signals for any detected identification code from said pair of detecting antennae to determine whether a said portable module has passed therethrough and if so to pass the detected identification code to said second communication means.
5. A queue management system as claimed in Claim 4, wherein the or each module detector includes means to pass to said second communication means any detected identification codes flagged as representing portable modules being only in the vicinity of said module detector if said correlation means determines that the portable modules have not passed through said pair of detecting antennae.
6. A queue management system as claimed in any preceding claims, wherein said transmitter means of each portable module is adapted to periodically transmit the identification code stored in said memory means.
7. A queue management system as claimed in any one of Claims 1 to 5, wherein the or each module detector includes a prompting transmitter for transmitting a prompting signal over a short range to cause any portable modules in range to respond by transmitting their identification codes, each portable module including prompt receiving means for receiving said



prompting signal, said transmitter means of each portable module being responsive to the received prompting signal to transmit the identification code stored in said memory means.

5

8. A queue management system as claimed in Claim 7, wherein said transmitter means of each portable module is adapted to transmit said identification code after a random or pseudo-random delay after said prompt receiving means receives said prompting signal.

10

9. A queue management system as claimed in any one of Claims 6, 7 or 8, wherein said transmitter means of at least some of said portable module transmit said identification codes at different frequencies.

15

10. A queue management system as claimed in Claim 8 or Claim 9, wherein said prompting transmitter of the or each module detector transmits an identifying prompting signal, and said portable module includes identification means to compare said identifying prompting signal with a stored prompting signal corresponding to a respective queue to determine whether the person or group of people are at the correct queue, and means to indicate to the person or group of people whether or not the person or group of people are located in the correct queue.

20

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11. A queue management system as claimed in any preceding claim for use in a defined area having at least one exit for the people or groups of people carrying said portable modules, the system indicating at least one said module detector at each exit to detect portable modules to prevent the portable modules being removed from said defined area.

30

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12. A queue management system as claimed in any preceding claim, wherein said queue manager is adapted to load as identification code into said memory means of a said portable module using said first  
5 communication means when said portable module is docked in a said docking station to register said person or group of people in a queue sequence.

13. A queue management system as claimed in any one  
10 of Claims 1 to 11, wherein the identification code is preloaded in said memory means of each portable module.

14. A queue management system as claimed in any  
15 preceding claim wherein the or each docking station includes queue display means for displaying a selection of queues which the person or group of people may wish to join; input means to allow the person or group of people to select which queue they  
20 wish to join; and downloading means for downloading the identification code of the docked portable module and passing the downloaded identification code to said queue manager via said first communication means, and for passing the identity of the or each queue which  
25 the person or group of people wish to join to said queue manager via said first communication means; said queue manager being adapted to register the person or group of people in at least one said queue sequence dependent upon the downloaded identification code and  
30 the received queue identity.

15. A queue management system as claimed in Claim 14, wherein said display means and said input means of the or each docking station are adapted to respectively  
35 display requests for data on the person or group of

people and to allow the input of such data for transmission to said queue manager via said first communication means.

5      16. A queue management system as claimed in any preceding claim wherein said indicator means of each portable module comprises a display to display messages indicative of the queues for which the person or group of people is registered to join and the time  
10      at which the queues should be joined.

17. A queue management system as claimed in Claim 16 wherein said docking station is adapted to allow the person or group of people to select a preferred  
15      sequence of queues to be joined and preferred times of joining the queue, and to reselect said preferred sequence and said preferred times.

18. A queue management system as claimed in Claim 16 or Claim 17 wherein said queue manager is adapted to  
20      optimise the position of a person or group of people in each of a plurality of queue sequences to allow the person or group of people to join each queue and attend each event being queued for.

19. A queue management system as claimed in Claim 18, wherein said queue manager includes queue information storage means to store information on the predicted rate at which the or each queue will move and/or the  
25      actual rate at which the queue is moving, said queue manager being adapted to use said stored information to optimise the length of the or each queue sequence and to enable the optimisation of the sequence of  
30      queues.

20. A queue management system as claimed in any one of Claims 16 to 19, wherein said queue manager is adapted to control said transmitter to transmit data on the queue sequence and times at which the queues should be joined, and said memory means of each portable module is adapted to store said data.

21. A queue management system as claimed in any one of Claims 16 to 20, wherein each portable module includes a message memory for storing a plurality of standard messages, said queue manager being adapted to send a desired message activation signal to selected said portable modules using said transmitter, and said selected portable modules being adapted to display a desired message from said stored plurality of messages on said display in response to said activation signals.

22. A queue management system as claimed in any one of Claims 16 to 22, wherein said queue manager is adapted to send a control signal to selected said portable modules, said selected signal to switch mode of operation to operate as a radio pager.

23. A queue management system as claimed in any one of Claims 16 to 22, including an access control mechanism associated with the or each module detector to allow access to a queue area for a queue, said queue manager being adapted to compare a detected identification code with the identification codes of the queue sequence associated with the queue to determine if said detected identification code falls within a predetermined range of the front of the queue sequence, and to transmit an access denied signal over said second communication means to said access control

mechanism if said detected identification code is determined to be outside said predetermined range, said access control mechanism being responsive to said access denied signal to prevent the person or group of people carrying the portable module associated with the detected identification code from gaining access to the queue area.

24. A queue management system as claimed in Claim 23, wherein said queue manager is adapted to transmit an explanatory message signal to the portable module which has been denied access to the queue area to explain the reason why access has been denied.

25. A queue management system as claimed in Claims 23, wherein said each portable module is adapted to store a default acceptance time window associated with each queue for which the identification code of the portable module has been entered in the queue sequence reason messages, a portable module which has been denied access being adapted to identify the pair of antennae to determine whether the portable module is at the correct queue area at the correct time, and to select and display an appropriate reason message to explain why access has been denied.

26. A queue management system as claimed in any one of Claims 16 to 25, wherein a plurality of said portable modules can be assigned as a group, each member of a group of portable modules having an identification code which identifies which group the portable module belongs to, the or each docking station being adapted to allow the selection of the option for the members of a group of people to each

have a portable module.

27. A queue management system as claimed in Claim 26,  
wherein said docking station is adapted to allow a  
5 member of a group to input a group specific message to  
said queue manager via said first communication means  
when the member's portable module is docked, said  
queue manager being responsive to said group specific  
message to transmit a message to all members of the  
10 group.

28. A queue management system as claimed in Claim 26  
or Claim 27, wherein said queue manager is adapted to  
monitor the locations of said portable modules, the or  
15 each docking station including means to input a  
location request to request the location of the group  
members when a group member's portable module is  
docked, said queue manager being responsive to said  
location request to transmit information on the  
20 location of the group members for display by the  
docking station.

29. A queue management system as claimed in any one  
of Claims 16 to 28, wherein said queue manager is  
25 adapted to monitor the locations of said portable  
modules and to send area specific messages to portable  
modules known to be in at least one specific area.

30. A queue management system as claimed in any one  
of Claims 16 to 29, wherein said queue manager is  
adapted to program the language of the messages  
displayed on said display of a said portable module  
when said portable module is docked.

35 31. A queue management system as claimed in Claim 21,

wherein said queue manager is adapted to send the messages stored in said message memory of a said portable module when said portable module is docked.

5     32. A queue management system as claimed in any preceding claim, wherein said queue manager is adapted to set the frequency of said transmitter of a said portable module when said portable module is docked.

10     33. A queue management system as claimed in any preceding claim including a plurality of portable tagging modules, each portable tagging module being arranged to be carried by a person or group of people to be tracked, comprising memory means for containing  
15     a unique identification code, transmitter means for transmitting said identification code over a short range to confine the transmitted identification code to a local region around the person or group of people carrying the portable tagging module, and docking  
20     means for docking with the or each docking station for downloading said identification code to said queue manager; the or each docking station being adapted to allow a person or group of people carrying a said portable module to associate at least one said  
25     portable tagging module with said portable module, said docking station having means for prompting the selection of a tagging option when said portable module is docked to download the identification code thereof, said means for prompting subsequently  
30     requesting the docking of a said portable tagging module to download the identification code thereof; said queue manager being responsive to said means for prompting and said downloaded identification codes to associate said identification codes; the or each  
35     docking station including means to transmit a location

request signal for an associated identification code of a portable module or portable tagging module when a portable module or portable tagging module is docked; said queue manager being responsive to said location  
5 request signal to transmit information on the location of the associated portable module or portable tagging module to said docking station for display thereby.

34. A queue management systems as claimed in any  
10 preceding claim, wherein each portable tagging module includes a receiver for receiving prompting signals from the or each module detector, said transmitter of each portable tagging module being responsive to said prompting signals to transmit said identification  
15 code.

35. A queue management system as claimed in any preceding claim, wherein the or each docking station includes payment means for receiving payment in  
20 respect of a queue which has a fee associated therewith, said payment means being adapted to request payment and await receipt of payment before registering a person or group of people in a queue sequence for a desired queue which has a fee  
25 associated therewith.

36. A queue management system as claimed in any one of Claims 1 to 34, wherein the or each docking station payment means for receiving payment to be credited to  
30 the person or group of people carrying a said portable module and to be associated with the identification code of said portable module; said queue manager including credit storing means for receiving and storing information on the payment to be credited to a  
35 portable module from said docking station, queue cost



information memory containing information on the cost  
of the or each queue which has a fee associated  
therewith, debiting means for debiting funds from the  
credit stored in said credit storing means for a  
5 portable module when said queue manager receives a  
detected identification code from said module detector  
at a queue which has a fee associated therewith; said  
queue manager being further adapted to transmit  
information on the credit stored in said credit  
10 storing means for a portable module to said portable  
module for display thereby.

37. A queue management system as claimed in Claim 35  
or Claim 36, wherein said payment means comprises a  
15 credit card reader.

38. A queue management system substantially as  
hereinbefore described with reference to and as  
illustrated in any of the drawings.



Patent  
Office

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Examiner: Mr. G. Nicholls  
Date of search: 20 February 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4T (TAA) G4H (HNND)

Int Cl (Ed.6): G07C 11/00

Other: ONLINE : WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2228123 A (EDDISON and SMITH)	

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

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A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.